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State Key Joint Laboratory of Environmental Simulation and Control (ESPC).

1996

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ESPC

STATE KEY JOINT LABORATORY OF ENVIRONMENTAL SIMULATION AND POLLUTION CONTROL

Earth Sciences Library



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State Key Joint Laboratory of Environmental Simulation and Pollution Control (ESPC)



Director of ESPC Laboratory——Professor Qian Yi

The ESPC State Key Joint Laboratory is composed by four sub-laboratories which are Water Pollution Control, Environmental Aquatic Chemistry, Atmospheric Environmental Simulation and Water Environment Simulation Laboratories. The organization and construction of the Joint Laboratory was approved by the State Planning Commission in June 1989 and supported by the World Bank loan and the investment of State Educational Commission and Chinese Academy of Sciences. According to the principle of conducting research and opening it to the outside of the Lab while it is constructing, the Joint Laboratory has begun to make full use as a center for

high level scientific research, training and academic exchange. The director of the Joint Laboratory is Ms. Qian yi, who is an academican of China Academy of Engineering and Professor of the Department of Environmental Engineering, Tsinghua University. The director of the academic committee is Professor Jing Wenyong, working in the Department of Environmental Engineering, Tsinghua University. The academic committee is composed of 20 famous experts in fields of environmental science and engineering at home and abroad. The director of the Joint Laboratory is responsible for the operation of the Joint Laboratory, and the activities of the Joint Laboratory are under the guidance and evaluation of the academic committee.

The research direction of the Joint Laboratory is to study important aspects of environmental science and engineering by using advanced technology of environmental simulation, and to develop advanced techniques for pollution control and environment management by means of the combination of scientific research and technology development. The Joint Laboratory serves to accelerate the development of environment protection and the strategy of sustainable development in China.

The Joint Laboratory has been conducting many scientific research projects supported by ministries and commissions of the government since 1989, and has obtained a large number of achievements in many interdisciplinary research projects.

Research Projects completed in the Joint Laboratory

<i>No.</i>	<i>Project</i>
1.	Technology For Sewage Treatment and Reuse
2.	Local Environmental Information Management System
3.	Atmospheric Diffusion Law and Regional Planning in Ningbo
4.	Anaerobic Biological Technology for High Strength Organic Wastewater
5.	Effects and Countermeasures of Economical Activities on Ecological Environment in Meizhou Gulf Development Zone
6.	Regional Evaluation of Atmospheric Environment in Ningbo City
7.	Environment Planning in Meizhou Gulf New Economic Development Zone
8.	Comprehensive Investigation of the Pastoral Protection Area in Inner-Mongolia by Using Remote Sensing
9.	Simulation Method of the Electrode System for an Electric Dust Collector
10.	Forecast of Pine Tree Caterpillar
11.	Environment Capacity of Grey Calcium Soil
12.	Resources Monitoring and Forecasting by Using Comprehensive Analysis Technology of Remote Sensing Information Received by Weather and Land Satellite
13.	Acid Rain Sources and Controlmeasures in the Southwest of China
14.	Comprehensive Control and Treatment of Loess Plateau
15.	Environment Capacity of Migration from Three Gorge Reservoir Area
16.	Remote Investigation and Information System of Ansai Experiment Zone in Loess Plateau
17.	Microorganism Toxin and Other Organics Result in Big Joint Sick
18.	Environment Capacity of soil
21.	Acid Rain Sources, Influence and Control Countermeasure in China
22.	Water Quality Requirement and Pollution Prevention of Cage Fishing
23.	Comprehensive Control of the Caterpillar in Horse Tail Pine Tree

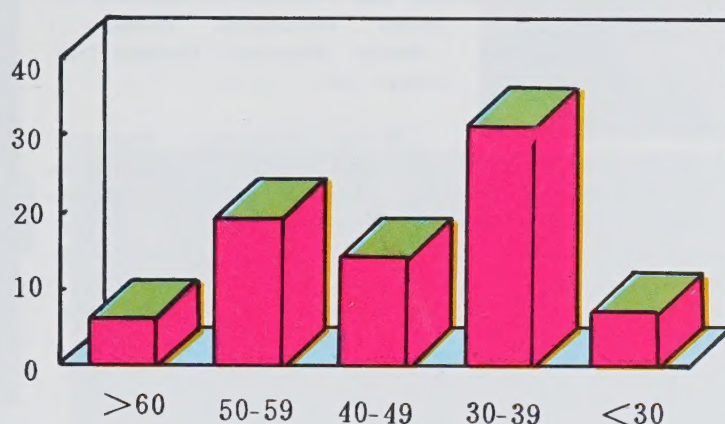
Publications completed by the academic staffs of the Joint Laboratory include:

Papers published in international journals:	63
Papers published in national journals:	540
Papers presented in international conferences:	111
Books have been published:	64

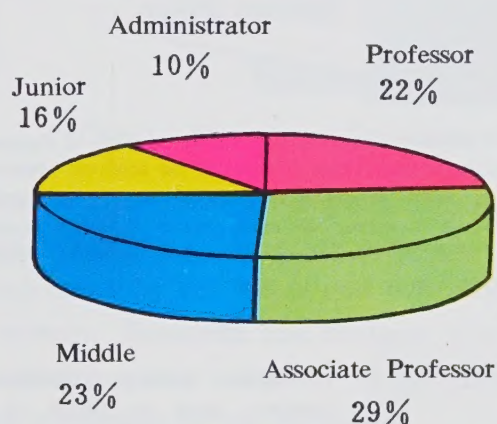
The Joint Laboratory offers 8 doctoral programmes with 15 supervisors and 5 post doctoral programmes. 49 doctors, 210 masters and 8 post doctors have been conferred since 1989. 82 doctor candidates, 137 master candidates and 7 post doctors are now studying and working in the Joint Laboratory.

There are 77 staffs working in the Joint Laboratory. The distributions of ages and professional titles of the staff members are shown as follows:

Age Struture of ESPC



Personals in ESPC



The Joint Laboratory has kept in close contact and cooperation with many famous universities, colleges and research institutes in foreign countries. It has carried out 22 international cooperation projects and organized many international conferences, workshops and training courses.

The Joint Laboratory has set up research foundation opening for application. Domestic and foreign researchers concerned are all welcomed to join in its research. The guidelines of open research projects have been issued by the Joint Laboratory and all Sub Laboratories.

Directors of the ESPC Laboratory



◀Qian Yi: Professor, the director of ESPC Laboratory. She is an academician of China Academy of Engineering and works in the Department of Environmental Engineering, Tsinghua University. She is also the member of the Environment and Resource Protection Committee, National Peoples Congress of China, the Vice chairman of the Committee of Engineering & Environment, World Federation of Engineering Organization. She is engaged in appropriate technology of water pollution prevention and enjoys a high reputation in the fields of environmental engineering and sanitary engineering at home and abroad. She has published books such as «The Prevention and Control of Industrial Environmental Pollution», «Modern Wastewater Treatment Technology» ect..

▶Jing Wengyong: Professor, the director of the academic committee of ESPC Laboratory. He works in the Department of Environmental Engineering, Tsinghua University. He is the member of China Committee, Committee of Environmental Problems, International Council of Scientific Unions, Vice chairman of the China Committee, International Association of Water Quality, member of the standing Committee, Chinese Society of Environmental Science. His research area is water environmental planning and management.



◀Shi Hanchang: Ph.D, the director of WPC Laboratory, deputy director of ESPC Laboratory. He is an associate professor of the Department of Environmental Engineering, Tsinghua University. He is the board member of the Urban Waste Management & Research Foundation of the University of New Orleans. He worked in Water Research Centre, UK as a research scientist in 1989, and worked in the Department of Environmental and Industrial Health of the University of Michigan in 1994. The major research field is the mechanism and technology of water and wastewater treatment.

▶Tang Hongxiao: Professor, academician of China Academy of Engineering. Director of the SKLEAC Laboratory, Vice-Director of the academic committee of the ESPC Laboratory. He works in Research Centre for Eco-Environmental Sciences, Chinese Academy of Sciences. His main research field is environmental aquatic chemistry and technology, especially on surface chemistry, coagulation and flocculation. He published more than 100 papers and a few books.



◀Shao Kesheng: Professor, Director of LAES Laboratory, atmospheric chemistry group in Center of Environmental Sciences, Peking University. He graduated from the Department of Atomic Energy, Peking University, and had been visiting scholar from 1981 to 1983 in the Georgia Institute of Technology. His research direction is atmospheric chemistry, environmental chemistry, environment data processing.

▶Zhao Junlin: Professor, Ph.D, Director of WES Laboratory. He is the director of the Institute of Environmental Science and deputy director of the School of Resources and Environmental Studies in Beijing Normal University. He won the Humboldt Scholarship of Germany and the Scholarship of the Royal Society of Britain. He took part in the Antarctic expeditions twice. He is also the member of Committee of Science and Technology, State Commission of Education, and member of Chinese National Polar Expedition Consultative Committee. His research direction is geochemistry, remote sensing and GIS.





Laboratory of Water Pollution Control

Brief Introduction

The Water Pollution Control Laboratory is a sub-laboratory of ESPC State Key Joint Laboratory, which is affiliated to the Department of Environmental Engineering, Tsinghua University. The Laboratory is focused on the research of water pollution control technologies and their mechanisms. Physico-chemical and biological technologies, environmental system engineering, automatic control and the use of computer technology in water pollution control are the main research topics of the laboratory. There are advanced instruments for water quality analysis, experiment and simulation facilities for water and wastewater treatment, and computer workstation and data processing system. Scientists and students from China and abroad in the field of water pollution control are welcomed to carry out study in the Laboratory. The Laboratory will support research projects based on the evaluation on the proposals.



Photo 1. International Conference Coorganized by the Laboratory

Research Fields

The research of the laboratory is aimed to develop appropriate technologies for water and wastewater treatment and to study the mechanisms of these processes. The major research fields are as follows:

- * Appropriate technologies and their mechanisms for wastewater treatment and reuse;
- * Appropriate water purification processes for polluted drinking water resources;
- * Ground water pollution control and remediation;
- * Mathematical model and automatic control of water and wastewater treatment process;
- * Strategic measures for regional environment pollution control and management.

Following research projects are given high priority by the laboratory;

- * Appropriate process and technology for sewage treatment and reuse;

- * High efficiency and low consumption biological wastewater treatment technology and its mechanism;
- * The degradability, degradation process and feasible treatment technology of toxic organics in industrial wastewater;
- * Pretreatment and post treatment technologies for polluted drinking water resources;
- * Appropriate technology and process of drinking water treatment;
- * The hydraulic collection technology and modeling for ground water pollution control;
- * Remediation of polluted ground water by using hydraulic, biological and physic-chemical technologies;
- * Modeling and simulation system of water and wastewater treatment process and its equipment;
- * The principle and technology of environmental information system.

Personnel Training

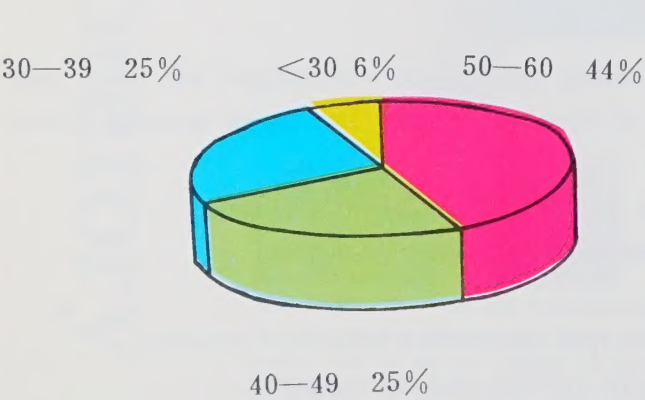
The laboratory has played an important role in training high qualified environmental scientists and engineers. There have been 31 doctors and 84 masters graduated from the laboratory. There are 30 to 40 undergraduate students, some ph. D and master candidates and postdoctors carrying out their research in the laboratory. Graduate courses such as “Mathe-matical Modelling of Biological Wastewater Treatment”, “Process Chemistry for Water and Wastewater Treatment”, “Environ-mental Systems Engineering” and “Environmental Science” etc. are offered by the Laboratory.

Institutional Framework

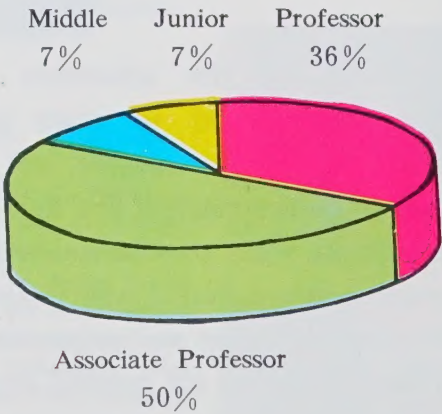
The director of WPC Laboratory is professor Shi Hanchang. Professor Qian Yi, an academician of



Photo2. Experiment of the brush aerator in oxidation ditch



Age Struture of WPC



Personals in WPC

China Academy of Engineering is the leader of the research team on water and wastewater treatment. 8 qualified young scientists and professors at middle-age are working in WPC Laboratory. The age framework and professional title distribution are shown as follows.

The laboratory is divided into four research groups based on the research topics as following:

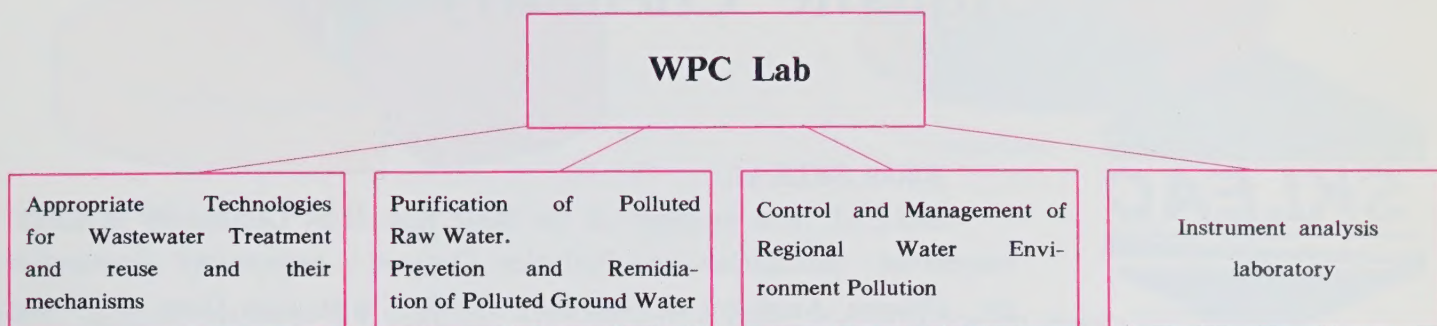


Photo3. Research on computer detection control systems

Experiment Condition

Laboratory possesses computer- control instru-ments, such as atomic absorption spectrophotome-ter, ultraviolet spectrome-ter, ion chromatography, gas chromatography, high performance liquid chro-matography, GC-MS, Ze-ta potential meter, Parti-cle size analyzer, TOC analyzer etc. These in-strument can detect most of the inorganic sub-stances, organic sub-stances and particals to

meet the basic requirements of the research in the field of water pollution control.

Experimental equipments controlled by computer, computer simulation systems of biological wastewater treatment processes micro computer network, data banks and graphic manipulation software with a computer work-station as the center are also installed in the Laboratory.

WPC laboratory is open to scientists who engage in water pollution control, and welcome to contact with us for information about project grant.

Director of WPC laboratory: Dr. Shi Han-chang
 Address: Department of Environmental Engineering
 Tsinghua University 100084
 P. R. China
 Tel: 86-010-2595684
 Fax: 86-010-2595687

Laboratory of Environmental Aquatic Chemistry



About SKLEAC:

SKLEAC is a member of the State Key Joint Laboratory of Environmental Simulation and Pollution Control, responsibly constructed by Chinese Academy of Sciences (CAS) with loan from the World Bank and financial input from CAS. SKLEAC was based on several laboratories in the Research Centre for Eco-Environmental Sciences (RCEES) in the field of water quality sciences and technologies. It

keeps close relationship with laboratory of membrane technology, laboratory of biological oxidation and laboratory of environmental analysis in RCEES when working on the specific project. SKLEAC is a multi disciplinary basic research centre including environmental aquatic chemistry as core, geography, biology, ecology, hydrology, environmental engineering and technology, as well as informative sciences.

Research Objectives:

The goal of SKLEAC is to promote the basic research on water quality transformation processes in natural environment and artificial strengthened technological systems in China. Specific objectives include: develop modern sciences and high-effective technologies for dealing with water quality problems in natural waters and water treatment processes; to establish applicable environmental water quality simulation system and computer software package; to develop industrialised water and high-effective wastewater treatment technology as well as the unit facilities; to optimise the scientific strategy for water quality resource management and utilization.

Research Topics:

1. Water quality identification: Qualitative, quantitative and speciation analysis of trace contaminants and particulate in different type of water.
2. Water quality processes: Physical, chemical, interfacial, geobiochemical processes through simulation and field experiments.
3. Aquatic eco-toxicology: Structure and function of aquatic ecosystems and ecotone, ecological and toxicological effects of contaminants, as well as their criterion and pollution control.
4. Water quality simulation: Models for chemical equilibrium, dynamic processing by environmental data

Director: Prof. Tang Hongxiao

Depute directors: Wang Zijian

Yi Chengqing

Cao Fucang

Address: P. O. Box 2871

Shuangqing Road 15

Haidian District

Beijing 100085

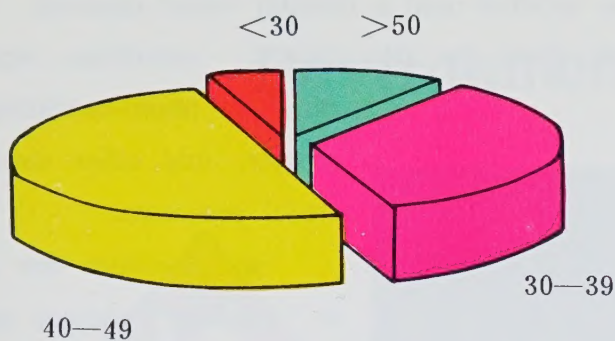
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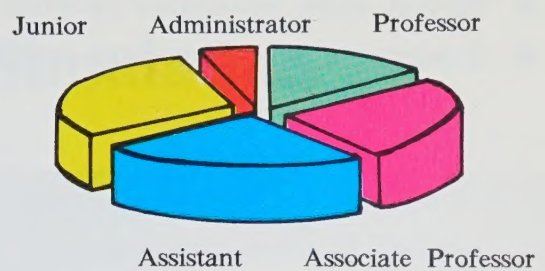
Fax: 86-010-2555381

E-mail: skleac@public.bta.net.cn

Age Structure of SKLEAC



Personals in SKLEAC



bank, personal computer software and working station based geo-information system (GIS).

5. Water quality transform technology: Reactors, facilities, unit operation and industrial processes for water and wastewater treatment, specifically on flocculation, membrane separation, chemical and biological oxidation techniques.

6. Water quality resource management: Water quality assessment, pollution load capacity, criterion, controlling strategy, optimal utilization scheme, as well as restoration, rehabilitation or reclamation technologies.



Photo1 International Cooperation

Personal, Projects and Budget:

SKLEAC has fixed positions for 3 professors, 4 associate professors, 12 research assistants or senior researchers and 1 administrator. A maximum of 15 short-time visiting scientists and 20 graduate students are expected working here every year.

On-going projects

include those from the state governments, from Chinese National Foundation, from CAS, as well as from industries. On-going projects include also those in collaborating with institutes in Japan, Germany, Canada, American, and Sweden. SKLEAC supports 14 open-projects in 1994-1995 using SKL's fund of CAS.

Total budget for projects in 1990-1995 is 3.9 millions of RMB. Budget for open-projects in 1994-1995 is 0.3 millions of RMB. Budget for personal, maintainance and operation is 0.4 millions of RMB per year.

Experimental Conditions:

SKLAEC has laboratory devices, equipment and simulation facilities include;

- ★ Natural water simulation facilities include six columns and a circular water channel.
- ★ Equipments for wastewater treatment include those for flocculation, membrane separation, photo-oxidation, reactor and other conventional processes.



Photo2. The laser scattering photometer for particulate analysis

- ★ Facilities for toxic bioassay include static and flowing through testing devices.

- ★ Analytical instruments include TOC analyser, AAS, GC/MS, UV-visible spectrometer, fluorescent spectrometer, HPLC, laser scattering photometer, electrochemical analyser, Hg analyser, capillary electrophoresis, microscopy,

luminometer, as well as field and laboratory devices.

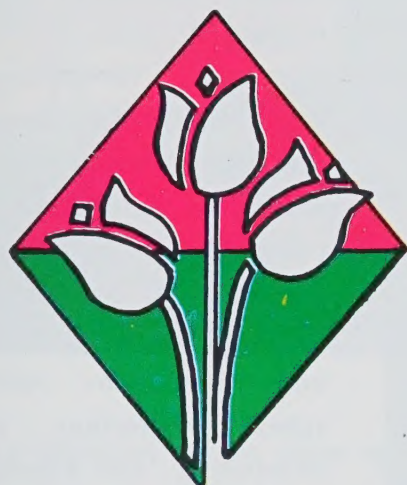
- ★ Hard wares for computerised simulation include two DEC work stations and relevant external devices, such as digitiser, scanner, plotters and printers. Soft wares include a GIS (version 6.01) and others for personal computer.

- ★ In constructing facilities include and outdoor macrocosmos for wetland and a greenhouse.



Photo3. The column simulator

Laboratory of Atmospheric Environmental Simulation



LAES

The Laboratory of Atmospheric Environmental Simulation (LAES) is one of the major parts of The State Key Joint Laboratory of Environmental Simulation and Pollution Control. It is established mainly in the Center of Environmental Sciences, Peking University, includes atmospheric chemistry, wind tunnel and air pollution control division which settled in the Department of Environmental Engineering Tsinghua University.

Main Fields of Research

The research of LAES is focused on the chemical-physical transformation and transportation processes of atmospheric pollutants, the regional and global problems of atmospheric environment and studies on pollution control technologies and strategies. Recently the LAES will prioritize following fields:

- Research on flux measurement of methane emission from the rice paddies and its relationship with agricultural cultivation.
- Research on the rules of pollution diffusion of vehicle gases in urban streets.
- Research on chemical process and transportation of Acid Rain and control strategies.
- Study on critical and target loads of acid deposition.
- Study on the new technology of desulphurization and dust collection integralization.
- Research on the distribution of tropospheric ozone in China.
- Research on the sources of atmospheric methane and other carbonaceous species by the application of AMS.
- Research on the dynamic of raising and precipitation of dust in the low atmosphere.
- Study on DMS emission measurement and environmental impacts in China.

Training Program

LAES is not only the basis of environmental basic and applied basic researches, but also basis for high level scholars training. Now LAES has two Doctoral degree programs and one station for Post Doctor's study. Since its establishment in 1989, LAES has produced 6 graduate students with Ph D. and 37 with Master's degree.

Director: Shao Kesheng, Professor

Vice Director: Xuan Jie,

Associate Professor,
Ph. D.

Ren Jiuchang,

Associate Professor

He Kebin,

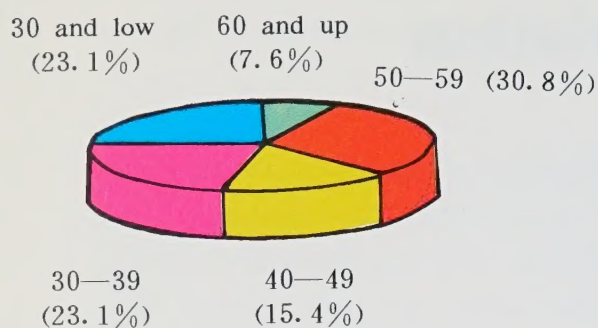
Associate Professor,
Ph. D.

**Address: Center of Environmental
Sciences, Peking University
Beijing 100871, P. R. China**

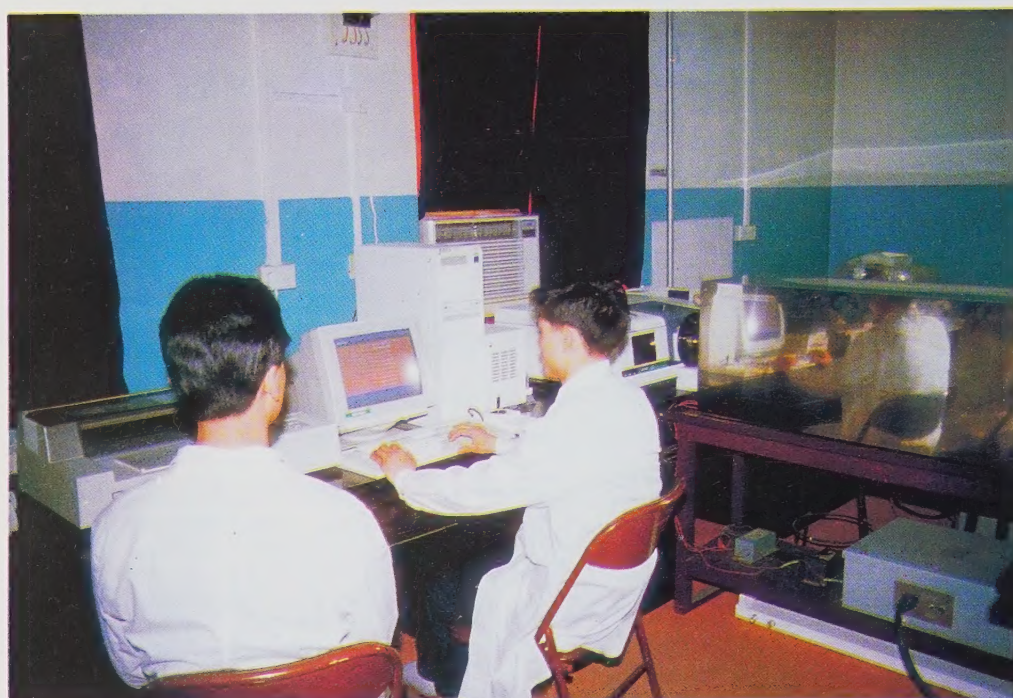
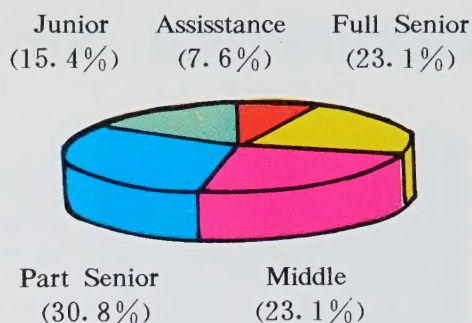
Tel: (01) 2501920

Fax: (01) 2501927

Composition of ages



Compositon of Professional titles



has 12 Doctoral candidates, 36 Master degree students and 2 Post Doctors in station.

The main courses of LAES for graduate students include: Atmospheric Chemistry, Environmental Fluid Dynamics, Environmental Quality Assessment, Pollution Meteorology, Research Method of Atmospheric Chemistry, Aerosols, Atmospheric Environmental Models and Simulation, Atmospheric Detection and Monitoring and Principal of Air Pollution Control, etc.

Personnel

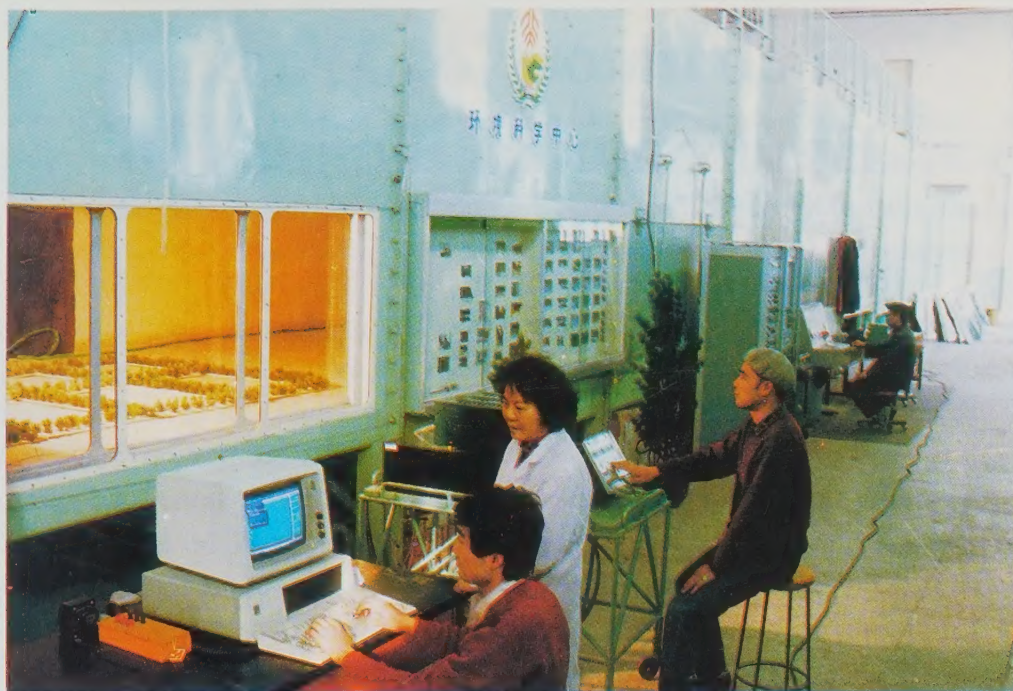
In the view of future development, the fixed staff of LAES is expected to be 20, now LAES has 13 fixed staff, the composition of professional titles and ages of the fixed staff is showed above.

Basic Equipment of LAES

The total areas that LAES occupied are about 1600m². The main basic instruments are:

FTIR system
(Fourier Transform Infrared Spectrum)

FTA65A type, the system includes also a high-sensitivity MCT detector and a long optical path quartz gas cell. It can analyze organic compounds in states of gas, liquid or solid and can be



used to simulate the photo-chemical reactions of atmosphere.

LIF system (Laser Induced Fluorescence)

The LIF system consists of a excimer laser, a dye laser, and a detection system which includes Boxcar Averager, Photon Counter, and Fast Digital Storage Oscilloscope, etc..

The LIF system is applied mainly to the qualitative and quantitative

detection of the trace species in atmospheric environment.

Two environmental wind tunnels

The first one, Thermal Wind Tunnel, is used to the physical simulation of mass transformation in environmental atmospheric dynamics.

The second one, Neutral Environmental Wind Tunnel, is an Open Circle Suction style.

The tunnels are equipped with advanced thermal wire anemometer, Ultrasonic anemometer, Multipoint anemometer, and Beckman hydrocarbon analyser etc..

Other instruments

Include Wet Denuder System, Correlation spectrometer Cospec V, NO_x, O₃, H₂O₂ Analyzer, HPLC and Ion Chromatography, Aerosol Analyzer, Laser radar, Stove plume sampling and monitoring system, Industrial coal combustion simulation system and Dust collection and desulphurization simulation system. etc.

LAES is open to scientists and students from both China and abroad for research on atmospheric sciences. Visit scholars and students are welcome to LAES to cooperation with us for clean air of our Earth.

Laboratory of Water Environment Simulation



The laboratory of Water Environment Simulation (WES) in the Institute of Environmental Sciences, Beijing Normal University, accepted a loan of US \$ 2, 000, 000 from the World Bank and a fund of RMB ¥ 1, 000, 000 from the Committee of Education in 1981. With this support, the 3, 900m² Water Environment Simulation Building, including a 400m² experimental hall was built and advanced instruments of water quality monitoring and analysing were brought and installed. WES was incorporated into the State Key Joint Laboratory of Environment Simulation and Pollution Control in 1989, and accepted a loan of US \$ 297, 000 from the World Bank as well as a sum of RMB ¥ 600, 000 for necessary accessories in 1991. The sum of

money has been used to equip the laboratory with computer workstations, data acquisition and control system, instruments for monitoring and analysing water quality and multifunction flume simulation system. In the past few years, the laboratory has been making the synchronous progress of facility perfection, scientific study, personnel training and academic exchanges.

Research Fields

1. Physical, chemical and biological migration and transformation processes of pollutants in various types of water environment;
2. Effect of polluted water on other environmental elements, such as soil, plants, animals and other organism;
3. Techniques for sustainable development and utilization of water resources;
4. Control and recovery of contaminative aquatic ecosystem and conservation of biodiversity;
5. Impacts of social and economic activities on water quality of natural water bodies and counter-measures for pollution control;
6. Nonpoint source pollution and its control strategies;
7. Techniques for water environment simulation.

Personnel Training

Post—graduate students

73 masters, 6 doctors and 1 postdoctor have successfully finished



Photo1. (Flume)

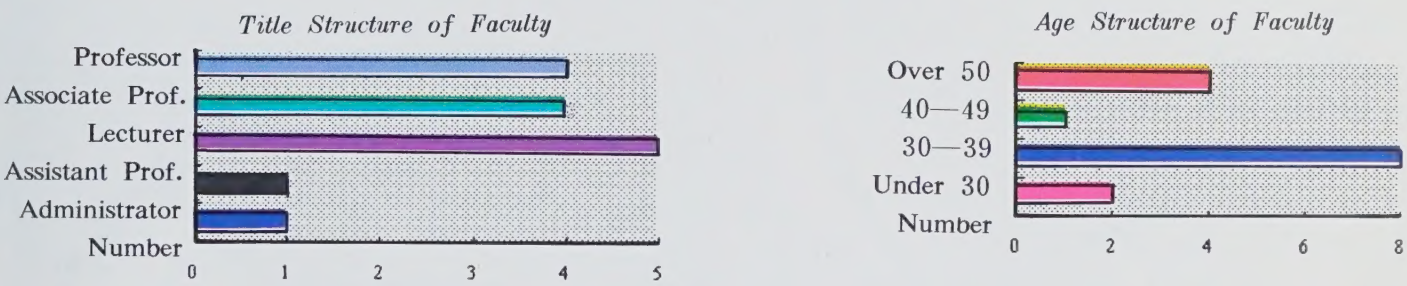
their courses and researches since 1989, and there are 38 postgraduate, 18 doctoral and 1 postdoctoral students are studying for their degrees.

Courses for post—graduate students

There are 10 required courses for post graduate students, namely, Principle of Environmental Science (60 hours), Water Environment Resesarch (60 hours), Environmental Ecology (60 hours), Environmental Geochemistry (60 hours), Environmental Quality Assessment and Planning (60 hours), Environmental Monitoring (50 hours), Environmental Simulation and Models (60 hours), Computer Language and Application (40 hours), Instrumental Analysis (120 hours) and Field Study of Environmental Monitoring (30 hours).

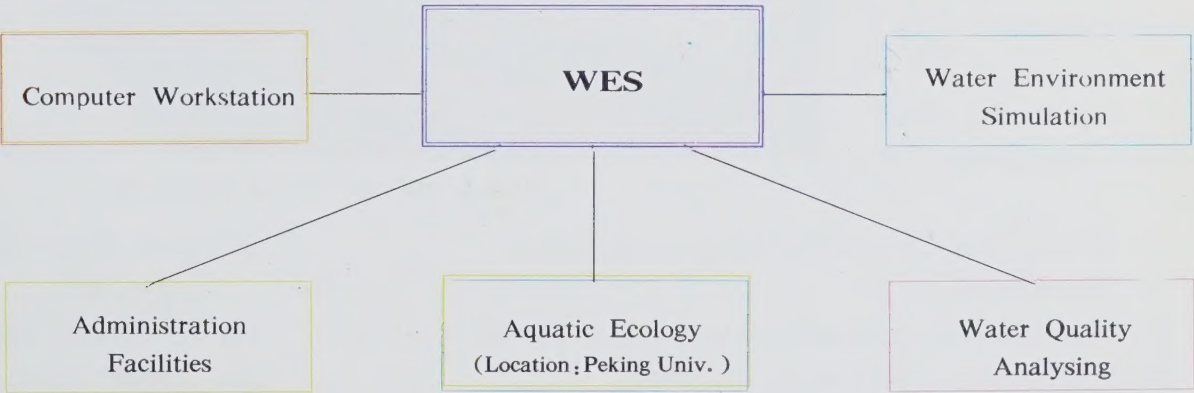
Faculty

There are 15 registered members in the laboratory. The title and age structures of Faculty are as follows:



Research Group

WES is composed of 5 research groups (see the following chart).



Facilities

The available instruments include:

1. Multifunction Flume Simulation System
 2. Data Acquisition and Control System (KOAAC 500/I)
 3. Computer workstation × 2 (HP9000/715—50)
 4. Multi—user computer (HP9000/807S)
 5. Perpherals Devices:
 - (1) Plotter (HP Draft Pro DXL)
- (2) Digitizer (CalComp 34480)
 - (3) Scanner (HP ScanJet II C)
 - (4) Laser Printer (HP LaserJet 4)
 - (5) Colar Printer (HP PaintJet)
 - (6) X Station × 2 (HP 700/RX)
 - (7) Character Terminal × 8 (HP 700/43)

6. Polarized Zeeman atomic Absorption Spectrophotometer (H180—80)

7. Electrochemistry System (Model 370)

8. UV / VIS Spectrophotometer (Model DU—8B)

9. Liquid Chromatograph (Model 440)

10. Gas Chromatograph (Model GC-A)

11. Ion Chromatograph (DX—30)

12. Fluorescence Spectrophotometer (Model F—4010)

13. Thermal Analyzer (Model 1090—B)

14. Controlled Environment Stimulation Device $\times 2$ (E—15, PGV—36)

15. BOD Auto Measurement / Record Instrument

16. BOD 20°C Temperature-controlled Equipment

17. Digital DO measurement Instrument $\times 2$ (M58)

18. Water / Soil Column Stimulation Equipment

19. Water Balancer

20. Water-Sediment Interaction Stimulation Device

21. Hydrometric Instruments, including:

(1) Suspended Sediment Sampler (LSS 400)

(2) Cup-type Shallow and Weak Current Metre (LS45)

(3) Signal Controls Current Meter (XKC—3)

(4) Printed Current and Discharge Meter (LJD)

(5) Hammer-knock Sampler for Suspended Sediment (XCT)

(6) Deep Water Temperature Gauge (SWJ—73)

(7) Pitot Tube $\times 2$ ($\varphi 8 \times 250$, $\varphi 8 \times 500$)

22. Systematic microscope

23. High-speed freezer and centrifugaler

24. Foster Box for Plants $\times 4$ (MLS—50)

25. Recorder Meter for Oxygen-demand and Activity (D1132A)



Photo2. (Computer Workstation)



Photo3. (Water Quality Analysing)

Director: Prof. Zhao Junlin

Vice-director: Associate Prof. Chen Feixing

Prof. Xue Jiyu

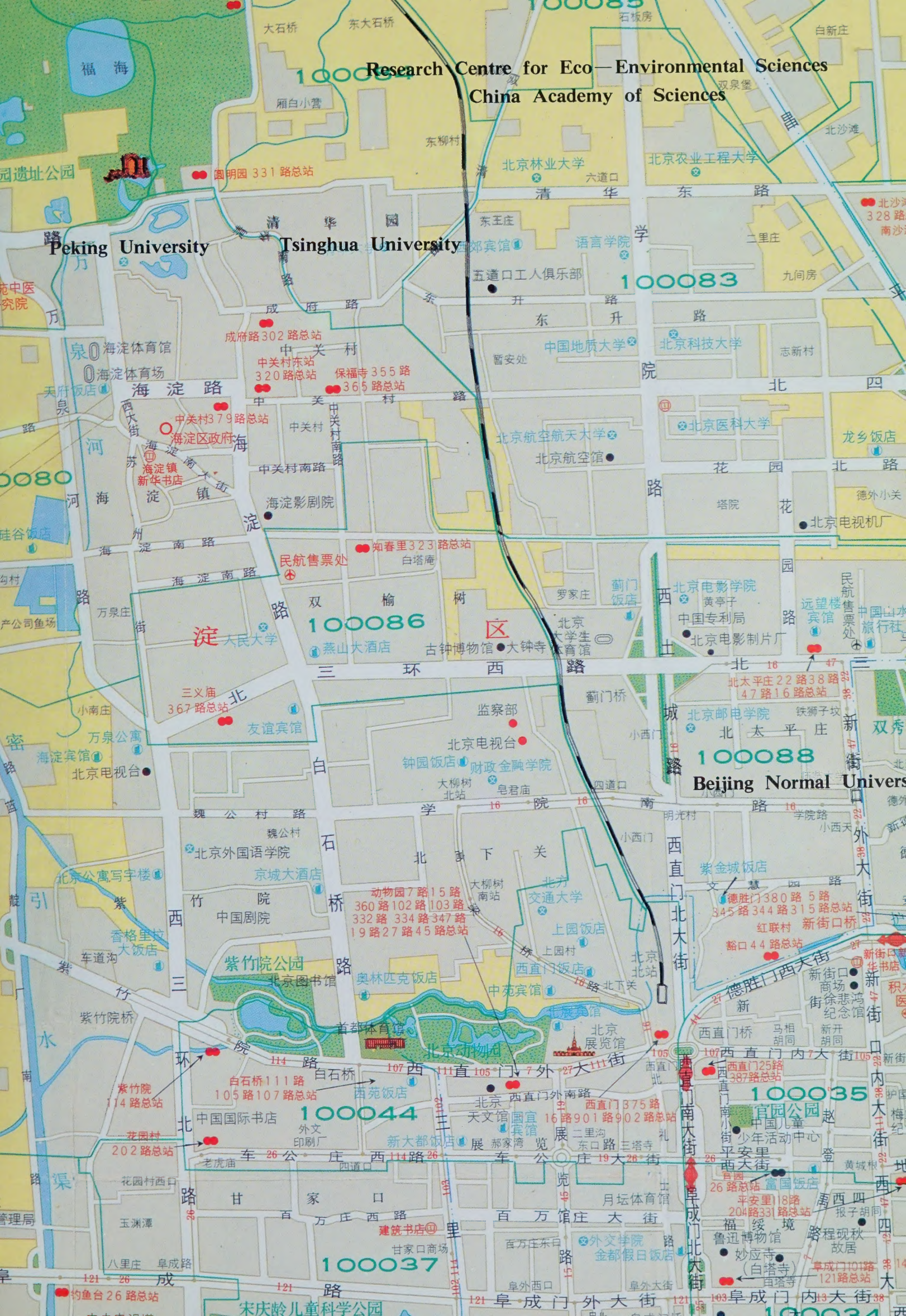
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Research Centre for Eco-Environmental Sciences
China Academy of Sciences

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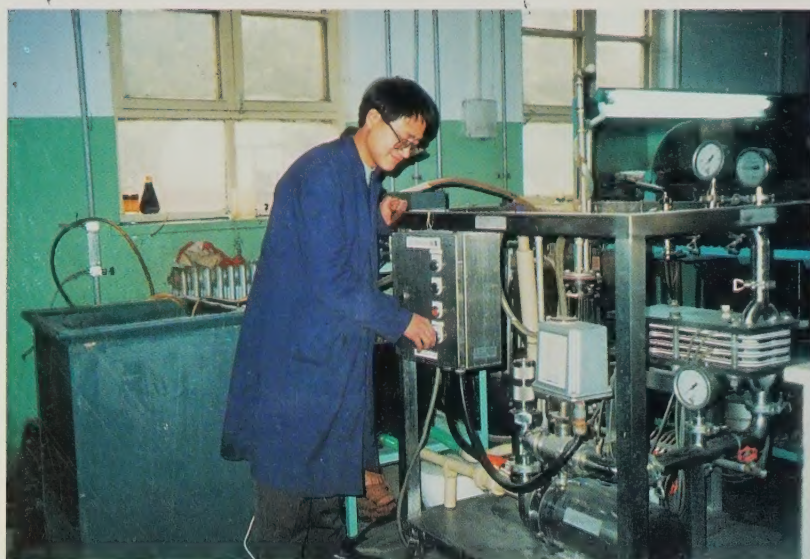
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1. Super filtration experimental facility in WPC Laboratory.



2. Circulatory water flow simulation system in SKLEAC Laboratory.



3. Dust removal experimental facility in LAES Laboratory.



4. A meeting on pollution control and planning of Huaihe River was held in WES Laboratory.